

CALICOPHORON DAUBNEYI INFECTION IN A MEDITERRANEAN AREA

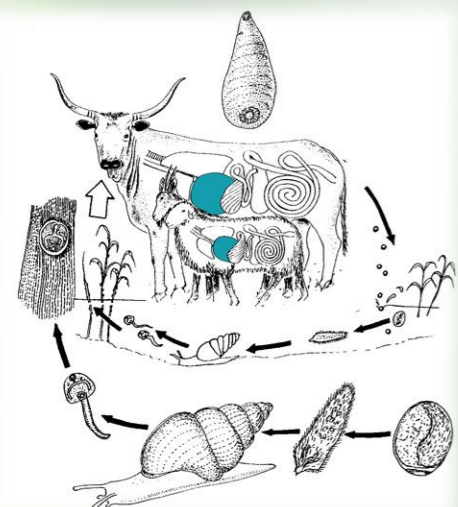
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ABSTRACT: Rumen flukes, more specifically *Calicophoron daubneyi*, represent a growing threat to the health of small ruminants in Europe [1, 2]. Geographical information systems (GIS) are configured as ideal technologies to determine environmental risk factors and to predict and delimitate the areas at highest risk for a snail-borne infections, in order to investigate the role of the different epidemiological components of a parasitic infection. The aim of this study is to assess the spatial distribution of *C. daubneyi* infections in sheep and goats in a Mediterranean area and to develop a predictive model on the environmental suitability of rumen flukes in the Basilicata region of southern Italy.

INTRODUZION

The lifecycle and spatial distribution of *C. daubneyi* are strictly correlated with environmental factors, since large and small ruminants become infected on pasture through ingestion of metacercariae emerged from fresh water gastropods that act as intermediate hosts. A thorough understanding of the spatial components of the infection is required for sustainable control strategies [1, 2].

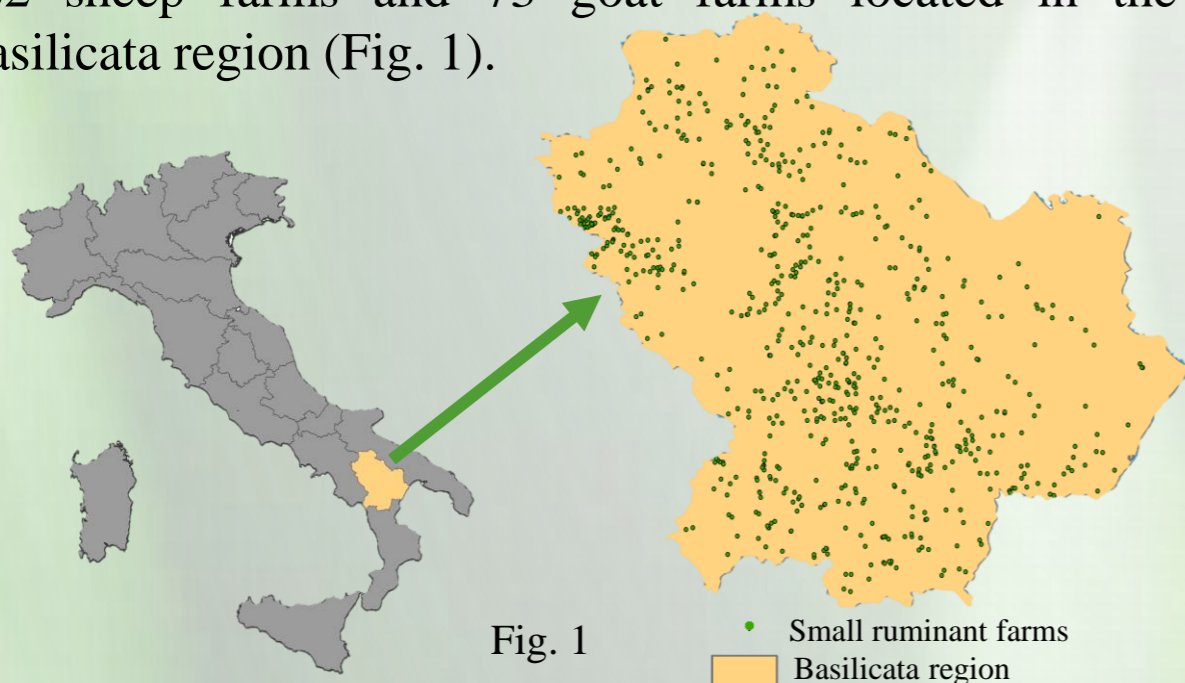


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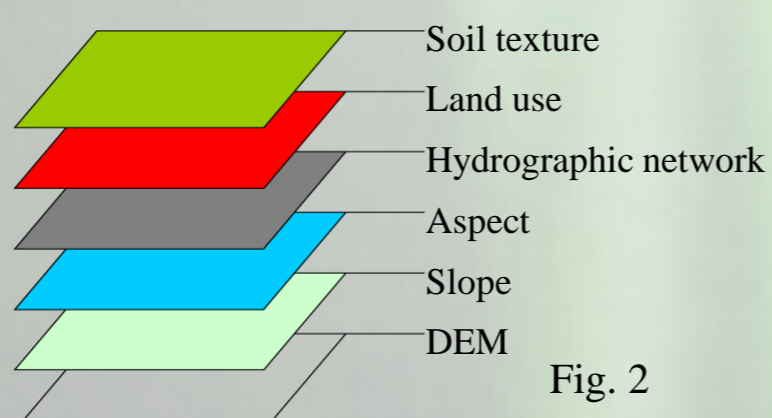


MATERIALS AND METHODS

A cross-sectional coprological survey was conducted on 682 sheep farms and 73 goat farms located in the Basilicata region (Fig. 1).



The faecal samples were analysed using the FLOTAC technique [3] with a zinc sulphate flotation solution (s.g. 1350). The predictive model of *C. daubneyi* distribution was created by using an adaptation of the Random Forest algorithm implemented in the platform ArcGIS Pro 2.7 (ESRI). The supervised machine learning method generated hundred of decision trees (Fig.3) to predict the presence/absence of the infection in the study area. The environmental variables in Fig. 2 were used as predictors and training data.

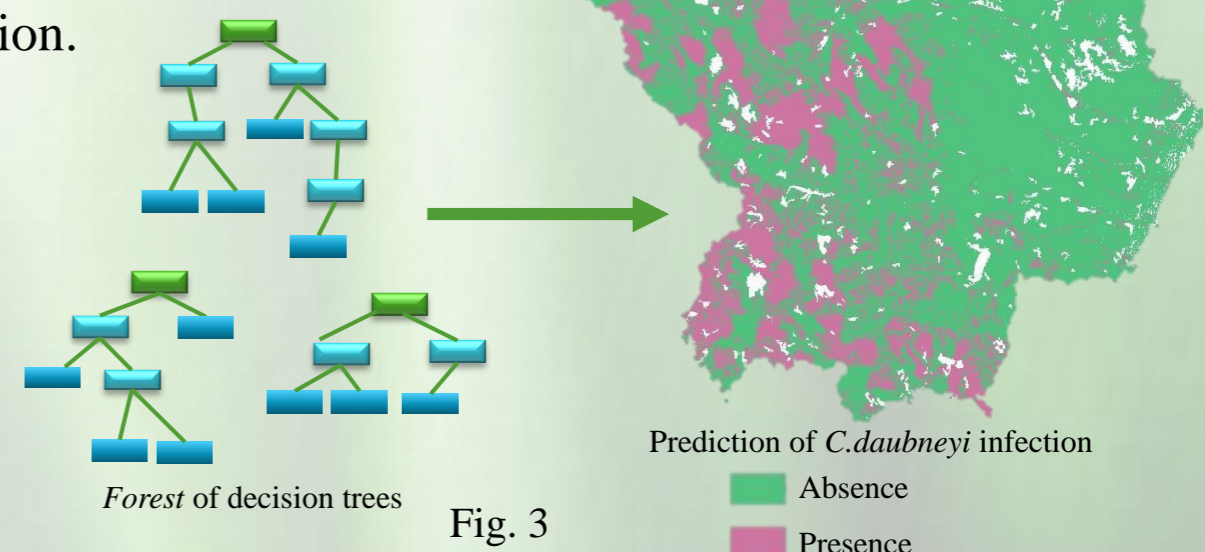


RESULTS

The results showed 7.9% (95% CI 6.05-10.27) of sheep farms and 2.7% (95% CI 0.48-10.44) goat farms infected by *C. daubneyi*. The areas with high predicted risk are situated in the western part of the region. The soil texture, land use and the distance from streams and brooks were the variables statistically significant in explaining the *C. daubneyi* distribution in the study area.

Variable	Importance	%
Soil texture	1.52	21
Land use	1.45	20
Hydrographic network	1.42	19
Aspect	1.41	19
Slope	0.79	11
DEM	0.79	11

A table showing the importance scores of the variables was generated by the algorithm. Importance was calculated using Gini coefficients, which can be thought of as the number of times a variable is responsible for a split and the impact of that split divided by the number of trees. Splits are each individual decision within a decision tree [4]. It is worth emphasizing that the use of georeferenced data and distance features ensured the RF predictive modelling technique a spatial connotation.



CONCLUSIONS

The findings demonstrated the efficacy of GIS for monitoring the spatial distribution of rumen fluke, providing useful tools to predict the parasitic infection in the study area and at other locations characterized by the same environmental explanatory variables.

REFERENCES:

- [1] Cringoli et al., 2004 Vet Parasitol 122:15-26 ; [2] Huson et al., 2017 Trends Parasitol 33: 836-844; [3] Cringoli et al., 2017 Nat Protoc 12:1723-1732; [4] <https://pro.arcgis.com/en/pro-app/latest/tool-reference/spatial-statistics/how-forest-works.htm>